

FUJITSU GENERAL ELECTRONICS LIMITED

FGI-6I020E065D1

IGBT MODULE

650V/20A IPM

■ Features

- DC input, 3-phase AC output IGBT IPM
- Built-in various protection functions (Over current protection, Over heating protection, Under voltage protection)
- Short-circuit warranty type IGBT (5μs/125°C)
- Reliability improvement by epoxy resin encapsulation



■ Dimensions

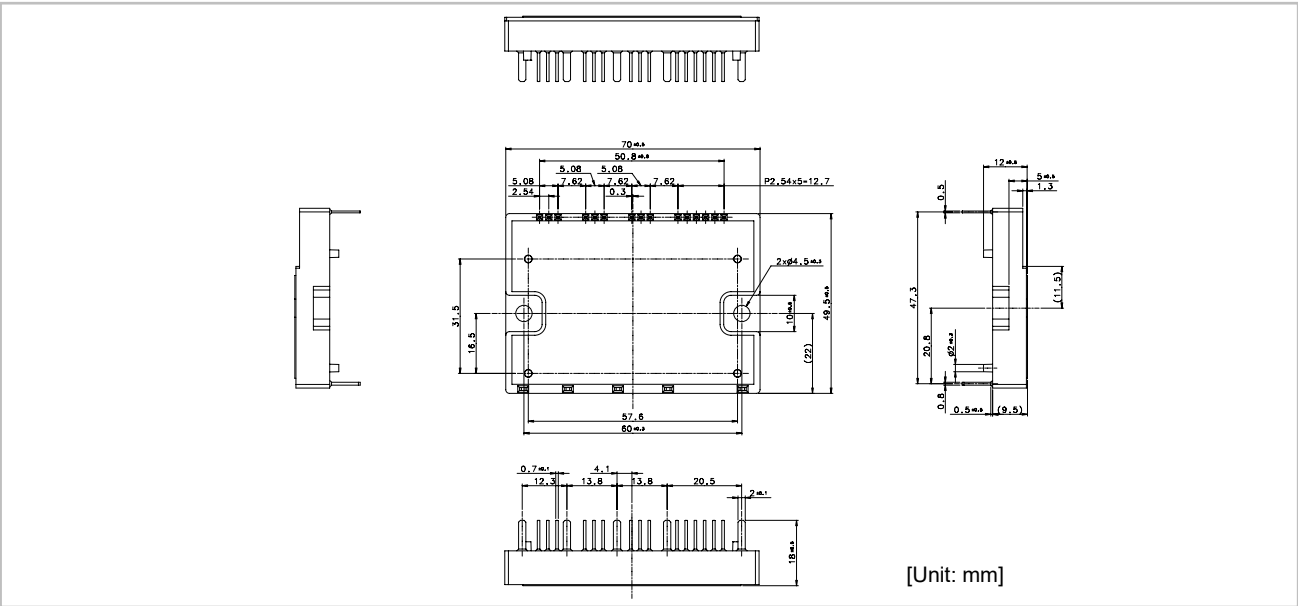


Fig.1. Dimensions

■ Pin Functions

Pin No.	Name	Function	Pin No.	Name	Function
1	GND U	Ground terminal (U)	9	Vcc W	Power supply (W)
2	Vin U	Driver input (U)	10	GND	Ground terminal (Under arm)
3	Vcc U	Power supply (U)	11	Vcc	Power supply for Under arm
4	GND V	Ground terminal (V)	12	Vin X	Driver input (X)
5	Vin V	Driver input (V)	13	Vin Y	Driver input (Y)
6	Vcc V	Power supply (V)	14	Vin Z	Driver input (Z)
7	GND W	Ground terminal (W)	15	ALM	Alarm output
8	Vin W	Driver input (W)			

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■ Block Diagram

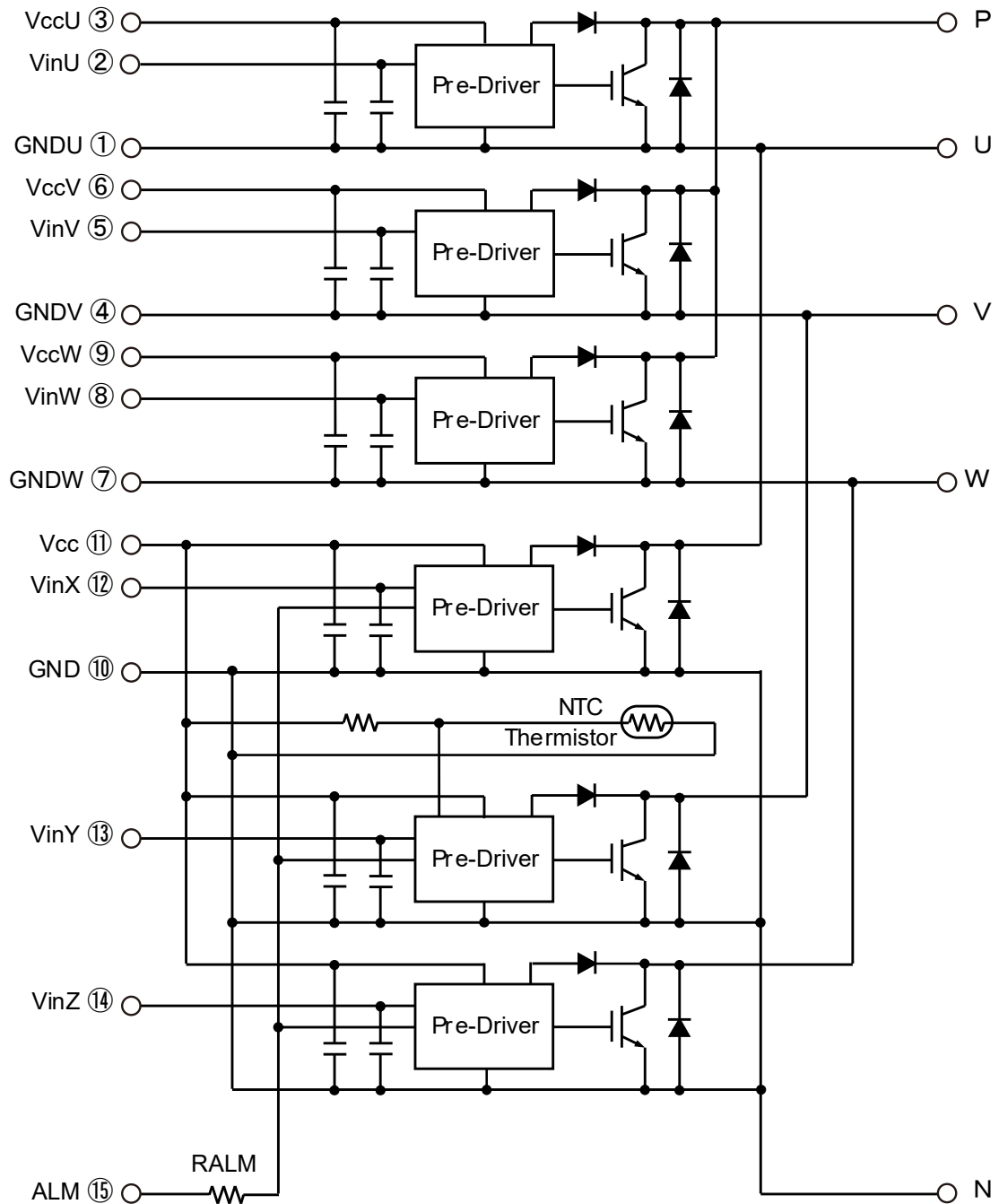


Fig.2. Block Diagram

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■ Absolute Maximum Ratings (Tc=25°C, Vcc=15V unless otherwise specified)

Items	Symbol	Min.	Max.	Units	
Collector-Emitter Voltage (*1)	V _{CEs}	0	650	V	
Short Circuit Voltage	V _{sc}	200	400	V	
Collector Current	DC	I _c	-	20	A
	1ms	I _{cp}	-	40	A
	Duty=100%(*2)	-I _c	-	20	A
Collector Power Dissipation	P _c	-	88	W	
Supply Voltage of Pre-Driver (*4)	V _{cc}	-0.3	20	V	
Input Signal Voltage (*5)	V _{in}	-0.3	V _{cc} +0.5	V	
Alarm Signal Voltage (*6)	V _{ALM}	-0.3	V _{cc}	V	
Alarm Signal Current (*7)	I _{ALM}	-	20	mA	
Junction Temperature	T _j	-	150	°C	
Operating Case Temperature	T _{opr}	-20	110	°C	
Storage Temperature	T _{stg}	-40	125	°C	
Solder Temperature (*8)	T _{sol}	-	260	°C	
Isolating Voltage (*9)	Viso	-	AC2500	Vrms	
Screw Torque	Mounting (M4)	-	-	1.7	N · m

Note*1: V_{CEs} shall be applied to the input voltage between terminal P-(U,V,W) and (U,V, W)-N.

Note*2: Duty=125°C/Rth(j-c)D / (If×Vf Max.)×100

Note*3: P_c=125°C/Rth(j-c)Q

Note*4: V_{cc} shall be applied to the input voltage between terminal No.3 and 1, 6 and 4, 9 and 7, 11 and 10.

Note*5: V_{in} shall be applied to the input voltage between terminal No.2 and 1, 5 and 4, 8 and 7, 12 - 14 and 10.

Note*6: V_{ALM} shall be applied to the voltage between terminal No.15 and 10.

Note*7: I_{ALM} shall be applied to the input current to terminal No.15.

Note*8: Immersion time 10 ± 1sec.1time.

Note*9: Terminal to base, 50/60Hz sine wave 1min. All terminals should be connected together during the test.

■ Electrical Characteristics (Tj=25°C Vcc=15V unless otherwise specified)

Items	Symbol	Conditions	Min.	Typ.	Max.	Units		
Collector Current at off signal	I _{CEs}	V _{CE} =650V	-	-	1.0	mA		
Collector-Emitter saturation	V _{CE(sat)}	I _c =20A	Terminal	-	-	2.25	V	
			Chip	-	1.65	-	V	
Forward voltage of FWD	V _F	I _F =20A	Terminal	-	-	2.05	V	
			Chip	-	1.45	-	V	
Switching time	t _{on}	V _{DC} =300V, T _j =125°C, I _c =20A		1.1	-	-	μs	
	t _{off}			-	-	2.1	μs	
	t _{rr}		V _{DC} =300V, I _F =20A	-	-	0.4	μs	
Supply current of P-side pre-driver (per one unit)	I _{ccp}	Switching Frequency=0-15kHz	-	-	13	mA		
Supply current of N-side pre-driver	I _{ccn}	T _c =-20~110°C	-	-	38	mA		
Input signal threshold voltage	V _{inth(on)}	V _{in} -GND	ON	1.2	1.5	1.6	V	
	V _{inth(off)}		OFF	1.5	1.65	1.9	V	
Over Current Protection Level	I _{oc}	T _j =125°C	30	-	-	A		
Over Current Protection Delay time	t _{ooc}	T _j =125°C	-	1.5	-	μs		
Short Circuit Protection Delay time	t _{sc}	T _j =125°C	-	4	5	μs		
Over Heating Protection Temperature Level	T _{OH}	Module center	140	-	-	°C		
Over Heating Protection Hysteresis	T _H		-	20	-	°C		
Under Voltage Protection Level	V _{UV}		11.0	-	12.5	V		
Under Voltage Protection Hysteresis	V _H		0.2	0.5	-	V		
Alarm Signal Hold Time	t _{ALM(OC)}	ALM-GND	V _{cc} ≥ 10V		1.0	1.3	(1.6)	ms
	t _{ALM(UV)}			T _c =-20~110°C	2.5	2.9	(3.2)	ms
	t _{ALM(ToH)}				5.0	5.6	(6.2)	ms
Resistance for current limit	R _{ALM}		1170	1300	1430	Ω		

Figures in () are reference values.

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■ Thermal Characteristics (Tc= 25°C)

Items			Symbol	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance (*)	Inverter	IGBT	$R_{th(j-c)Q}$	-	-	1.41	°C/W
		FWD	$R_{th(j-c)D}$	-	-	1.63	°C/W
Case to Fin Thermal Resistance with Compound			$R_{th(c-f)}$	-	0.17	-	°C/W

Note *: For 1 device, the measurement point of the case is just under the chip.

■ Recommended Operating Conditions

Items	Symbol	Min.	Typ.	Max.	Units
DC Bus Voltage	V_{DC}	-	-	400	V
Power Supply Voltage of Pre-Driver	V_{CC}	13.5	15.0	16.5	V
Switching frequency of IPM	f_{SW}	-	-	20	kHz
Arm shoot through blocking time for IPM's Input signal	t_{dead}	1.0	-	-	μs
Screw Torque (M4)	-	1.3	-	1.7	N · m

■ Weight

Items	Symbol	Min.	Typ.	Max.	Units
Weight	Wt	-	80	-	g

Disclaimer

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- (1) When exporting or taking out the product and technical information described in this document, please comply with the "Foreign Exchange and Foreign Trade Control Law", "Export Administration Regulations" and related laws and regulations.
- (2) The technical information described in this document shows characteristics of the product, applied circuits, etc. and does not imply assurance of the industrial property rights, etc. or permission of the execution rights.
- (3) This product has been designed to be used for general electronic equipment for standard purposes. This product cannot be used for any purpose with which special quality and reliability are required and breakdown or malfunction of it may directly threaten a human life or harm a human body (for special uses such as for aviation and aerospace purposes, for burning appliances, traffic equipment, life support equipment and safety devices)
- (4) Please pay special attention to the operational power source voltage range, category temperature/humidity range when using this product. If used exceeding the guaranteed values, we are not liable for any defect or breakdown that has happened after the use. Even if used within the guaranteed values, be sure to have redundancy design with which equipment using our product is not contrary to various laws due to operation of our product.